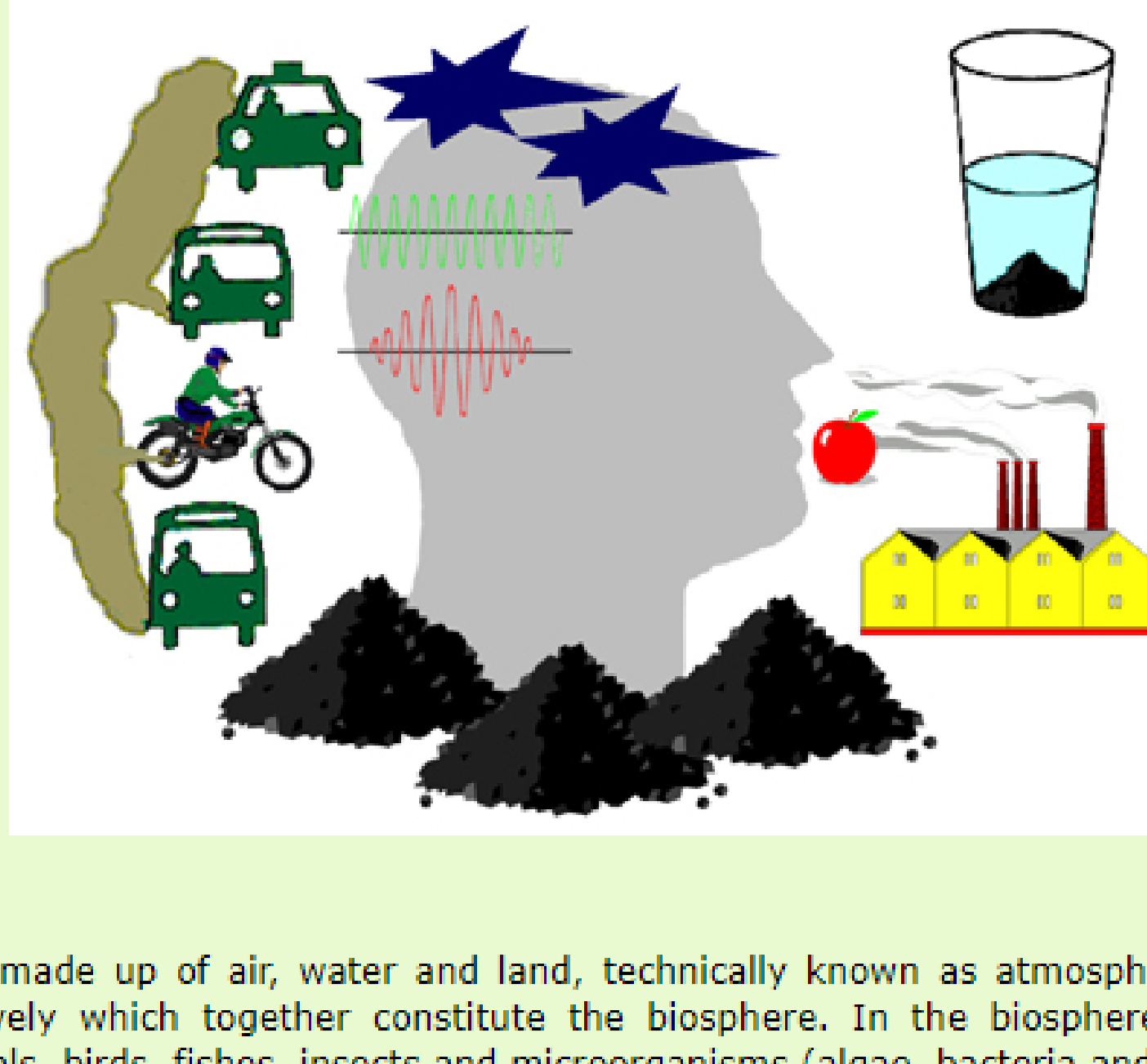


POLLUTION AND HEALTH

"The earth has become a very sick planet and urgently needs a cure. A disaster is looming around. Unless otherwise checked, the whole planet would become uninhabitable."



Pollution

The environment is made up of air, water and land, technically known as atmosphere, hydrosphere and lithosphere respectively which together constitute the biosphere. In the biosphere, apart from human beings, plants, animals, birds, fishes, insects and microorganisms (algae, bacteria and virus) also exist. The atmosphere provides oxygen, while the hydrosphere and lithosphere provide food, water and space. Whenever a change, physical or chemical, occurs in the atmosphere, hydrosphere or lithosphere, all living beings are affected. This change is termed as pollution and the agents that institute these changes are called pollutants.

Pollution is any undesirable change in the physical, chemical or biological characteristics of air, water or land. Pollution can harm the health and threaten the survival or activities of human beings and other living organisms.

It is difficult to estimate the desirable and undesirable effects of any activity which alters the environment. Sometimes short-term gains can cause immeasurable damage in the future, as seen in the case of use of nuclear energy, motorcars, air-conditioners and refrigerators, etc. In an age of fast material change, pollution is an unavoidable result. History has shown that societies pollute first and pay later. As the decline of the biosphere continues unchecked, people must find the will to force governments and industries to change existing conditions.

Types of pollutants

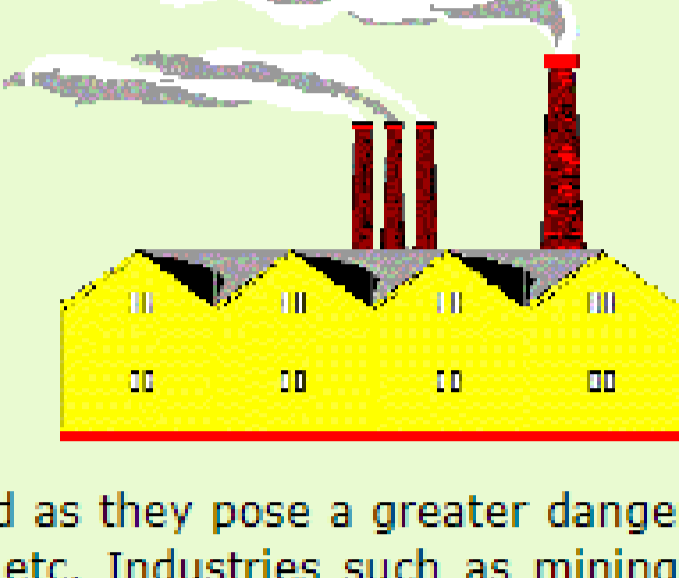
Degradable pollutants are those that can be decomposed, removed or consumed or reduced to acceptable levels either by natural or artificial means. However, pollutants such as human sewage and animal and crop wastes can decompose only if the system is not overloaded. Certain chemicals decompose slowly, and can persist at harmful levels for decades like detergents and pesticides.

Nondegradable pollutants include many radioactive materials, heavy metals and some plastics which cannot be degraded by natural or artificial means. They must be controlled or prevented from reaching the environment.

Type of pollution	Pollutant
Air pollution	suspended particulate matter, sulphur dioxide, oxides of nitrogen, etc.
Water pollution	microorganisms, fluoride, cyanide, sulphate, etc.
Soil pollution	heavy metals like arsenic.
Food pollution	pesticide, microorganisms, lead, cadmium, etc.
Noise pollution	industrial activity, traffic, loudspeakers.

AIR POLLUTION

Clean air, which is essential for the survival of all living organisms, is rapidly becoming scarce. At mean sea levels air contains 20.94% oxygen and 78.09% nitrogen. Other elements present comprise less than one percent of its composition.



Air pollution can be due to natural or man-made causes. The former is beyond our control as natural disasters like dust storms, earthquakes and volcanic eruptions throw up large quantities of dust and gases into the atmosphere. Man-made causes, however, should be prevented or controlled as they pose a greater danger by way of toxic emissions from factories, power plants, vehicular traffic, etc. Industries such as mining, thermal plants, brick kilns, etc. also pollute the air. These emissions are particularly intense in urban conglomerations where the density of human habitation is very high.

Types of air pollutants

Primary pollutants are those which are emitted directly into the atmosphere, like sulphur dioxide, nitric oxides and carbon monoxide.

Secondary pollutants are pollutants formed by the photochemical reaction of primary pollutants. For example, "smog", is a combination of smoke and fog. Smoke consists of carbon particles and fog is an emulsion of water vapour in air. Smog has become very common in large cities, especially during winter. Similarly acid rain is formed by the combination of sulphur dioxide and water vapour present in the air.



Pollutants in the air can be dispersed by wind movement, temperature and topography.

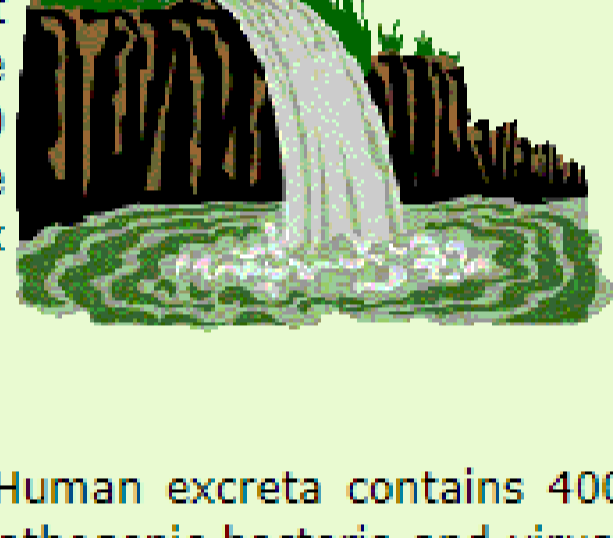
Major air pollutants and their effect on human health		
Pollutant	Origin of Pollutant	Effects
Sulphur dioxide	industries, especially where coal or oil are used as fuel	irritation of eyes, and respiratory system, increased mucus production, cough and shortness of breath
Carbon monoxide	automobile exhaust and industries	reduction in oxygen-carrying capacity of blood
Oxides of nitrogen	automobile exhaust	irritation of pulmonary tract affecting functioning of lungs
Hydrocarbons	automobile exhaust	lung cancer
Chlorine	chloralkali industry	irritation of mucous membrane
Ammonia	fertiliser, industry, agriculture and in poultry farming	irritation of mucous membrane
Hydrogen sulphide	manufacture of coke, viscose rayon, distillation of tar and petroleum	excessive inhalation leads to death
Acids and aldehydes	chemical industries	eyes, nose and throat irritation
Suspended particulate matter (SPM)	industries, automobile exhaust	respiratory diseases
Dust	industries and automobile exhaust	silicosis
Asbestos	roofings, brake linings	asbestosis
Lead	automobile exhaust	cumulative poison, impairment of central nervous system
Beryllium	aerospace industry, manufacture of house-hold appliances	fatal to heart and lungs
Manganese	mining operations	damages nerves and reproductive system
Benzene	automobile exhaust and manufacture of chemicals	leukemia, chromosomal damage
Pesticides	manufacture and application of pesticides	depression; leads to death if inhaled in excess
Arsenic	thermal power plants	toxic

Other effects of air pollution

- Ozone causes reduced pollination and yellow spot formation on leaves, thus affecting the rate of photosynthesis.
- Sulphur dioxide is converted to sulphuric acid in the presence of moisture and iron, which are present in dust, nails, etc. This results in yellowing, weakening and corrosion of materials.

WATER POLLUTION

Like clean air, fresh water is also becoming a scarcity. The limited availability of fresh water and its unequal distribution make water pollution a matter of great concern. Water pollution is generally localised and confined, making it more severe. The pollutants undergo many reactions and can become hazardous. 70 % of India's fresh water is polluted, including several high altitude lakes. While water pollution is easier to study and manage, its control is highly complex and very costly.



Sources of water pollution

In underdeveloped countries, sewage is a major source of water pollution. Human excreta contains 400 different species of bacteria and viruses. Even well-treated sewage contains pathogenic bacteria and virus, unless properly chlorinated before being discharged into any water course. Sewage is a major contributor to water-borne diseases and affects the health of people and other organisms in the environment in many ways.

Industrial effluents from sugar factories, distilleries, tanneries and paper industries are accompanied by very high organic loads. By-products of paper and pulp industry cause depletion of fish upto as far as 40 km downstream. The wastes from oil refineries and steel industries contain phenol which imparts a strong odour, apart from poisoning the water body. Fertiliser industry wastes contain ammonia, urea, phosphate and sulphate which, in water, cause algal bloom and are toxic to aquatic fauna and flora. Alkaline industry wastes contain mercury which can kill human beings who consume mercurised fishes. Lead generated from battery, printing, petrol and paste-processing industries, trace and toxic elements such as zinc, copper etc., and effluents from mining industries are injurious to aquatic organisms.

Water in which maximum permissible concentration of any single or more constituents is in excess is unfit for drinking and human health.

There are definite tolerance levels for water used for different activities such as drinking, bathing, irrigation and industrial purposes. Depending on its use, there are different physio-chemical and bacteriological standards for water.

Major water pollutants and their effect on human health		
Pollutant	Origin	Effects
Arsenic	pesticide industries and agriculture	toxic, eruptions on skin, carcinogenic
Cadmium	industrial waste discharge	may substitute calcium in bone structure, causes a disease - Itai-Itai in Japan
Chlorine	industries using chlorine bleach	physiological
Chromium	industrial waste, especially from tanneries	toxic and carcinogenic
Cyanide	pesticides	toxic and fatal
Lead	industrial, mine and smelter discharges, water pipes	causes a disease called plumbism
Nitrates and Nitrites	fertilizer industries	cause metaemoglobinemia in infants
Sulphates	leaching of gypsum or industrial waste discharges	have laxative effect in combination with magnesium or sodium in drinking water, may form hydrogen sulphide gas which is fatal for workers in sewers
Selenium	pesticides, industrial waste	carcinogenic, causes caries
Mercury	pesticides brain damage	toxic, causes foetal
Bacteria	sewage	cholera, typhoid, hepatitis, dysentery

SOIL POLLUTION

Land is a very valuable but limited resource, as the population increases rapidly. Many highly urbanised cities are faced with acute space problems, as in Calcutta or Bombay. Besides the limited availability of land, 175 million hectares of land are becoming less productive every year. India loses 20 tons of topsoil per hectare in a year due to floods, rainfall and deforestation. 20 % to 50 % of lands under irrigation can go out of cultivation at this rate because of water logging and salinity.



This scenario of desertification is compounded by pollution which includes

- indiscriminate discharge of industrial effluents on land and into water bodies
- an increase in the use of fertilisers for agriculture
- open defecation by animals and human beings
- accumulation of solid waste; this is a major problem in developed countries like India where the garbage and refuse products are not degraded
- radioactive substances from nuclear plants which are released into the soil

Major soil pollutants and their effect on human health		
Metal	Source	Effects
Arsenic	occurs naturally	chronic poisoning leads to a loss of appetite and weight, diarrhoea, alternating with constipation, gastro intestinal disturbances, peripheral neuritis, conjunctivitis and sometimes skin cancer
Cadmium	mining, metallurgy chemical industry and electroplating	leads to chronic poisoning and affects the proximal tubules of the kidney, causing formation of kidney stones
Lead	lead smelters storage battery	lead poisoning can lead to severe mental retardation or death
Mercury	industrial wastes	methyl mercury compounds are much more toxic than other forms of mercury, causes neurological problems and damages renal glomeruli and tubules
Cyanides	wastes from heat treatment of metals, dismantling of electroplating shops, etc.	rapid death may follow due to exposure to cyanide as a result of inhibition of cellular respiration

FOOD POLLUTION

Removal of nutrients or the addition of adulterants into the food chain will also harm our health.



Sources of pollution

Adulteration: Foreign substances are deliberately mixed with food materials for economic gain.

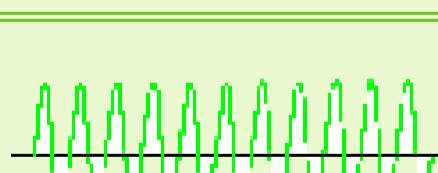
Environmental pollution: Undesirable substances enter the food chain through agencies such as contaminated fish and food, microbes, chemical pollutants in water including fluoride, lead, tin, cadmium, etc.

Pollution of food comes from the pollution of water and soil. If that is prevented, our food will be nourishing and healthy and fit for eating.

Major food pollutants and their effect on human health			
POLLUTANT	Source	Effects of health	
Organochlorine DDT, BHC (lindane) aldrin, dieldrin	compounds used to control mosquitoes	affects nervous system	
Organophosphorous compounds (parathion, malathion, toxaphene)	used in agriculture to kill pests	affects nervous system, through vegetables, breast milk, fish and meat	
Bacteria	handling and water used in food preparation	typhoid, dysentery, amoebiasis, jaundice, etc.	

NOISE POLLUTION

Noise is unwanted sound and has become a part of urban life and industrial centres in this century. Noise pollution may come from loudspeakers, factories, aeroplanes, moving trains, construction activity or even a radio.



Noise level of 80 decibels or more for more than 8 hours a day increases tension and changes in breathing patterns. Continued exposure to high levels of noise results in fatigue, hearing loss or even total loss of hearing, changes in blood circulation, changes in breathing, etc. Noise pollution above 120 decibels can cause many adverse biochemical changes. Cholesterol levels in the blood and white cell counts increase, besides causing hypertension.

Control of noise pollution

- A green-belt effectively reduces the noise.
- A 20 foot wide plantation inside the compound protects the house from the noise of vehicular traffic.
- Decibel metres should be installed along highways and in factories to check and control the intensity of noise pollution.

Psychological and physical effects of noise at different decibel levels (db)		
Noise Level in decibels	Source	Effect
135	pneumatic drill	painful
110	rock band	pneumatic drill
88	industry / city traffic	hearing impairment on prolonged exposure
80	alarm clock	annoying
65	average city traffic	intrusive

We have poisoned the air, water and soil with pollutants and have upset natural communities in ways that are affecting our place in the complex system that has come to be known as "the great chain of life". We may soon be tipping the balance of the natural forces in the land, atmosphere and oceans in ways that could be disastrous for mankind. In fact we have reached a point where we must protect the environment in order to protect ourselves.

In India alone, stupendous amounts of air pollutants enter the atmosphere per annum. The pollutants comprise of 50 lakh tonnes of particulate matter, 30 lakh tonnes of sulphur dioxide, 10 lakh tonnes of carbon monoxide and 22 lakh tonnes of hydrogen sulphide. Chennai too is one of the four metropolises to suffer the consequences of polluted air, though the greater effect can be felt in north Chennai where the industries are clustered together.

GREEN CODE

Here are some things you can do to keep the environment clean and at the same time make a small but significant contribution to check pollution.

Find out as much as you can about environmental problems. Get your family and friends interested too.

Do not use the car unless you have to. Walk, cycle or use public transport.

Recycle your rubbish.

Look after your pets and plants.

Never drop litter. Pick up litter you see lying on the ground.

Do not waste electricity or water. Remember to turn off lights and taps.

Look carefully at what you buy. Avoid buying over packaged goods, processed foods, strong chemicals or other wasteful items.

Avoid using chemical pesticides or fertilizers in your garden.

Begin a campaign to stop pollution, or save an area of wasteland for wildlife.